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EXAMINER	
OVEISSI, DAVID M	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

us-docketing@qualcomm.com

Office Action Summary	**Application No.** 10/801,624	**Applicant(s)** KADOUS, TAMER	
	Examiner DAVID OVEISSI	**Art Unit** 2464	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 October 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-19,21-24,26-29 and 31-49* is/are pending in the application.

4a) Of the above claim(s) *2, 20, 25, 30, and 40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-19,21-24,26-29,31-39 and 41-49* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claims **2, 20, 25, 30,** and **40** have been cancelled.

Response to Arguments

1. Applicant's arguments with respect to claims 1, 3-19, 21-24, 26-29, 31-38 and 41-49 have been considered but are moot in view of the new grounds of rejection.

Applicant previously argued that **Piirainen** does not teach channel coding in independent claim 1.

Examiner respectfully disagrees. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., channel coding) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argued that the support for the rejected the limitation “wherein each of the plurality of symbol blocks is transmitted <u>at most once</u> to the receiver is found in paragraphs 44, 46, 48, and Fig. 4A. Here are the contents of the argument made by the applicant

As described in paragraph [0044] of the present application, a data packet may be encoded to generate a coded packet. As described in paragraph [0046], the coded packet may be partitioned into N_B coded subpackets. The first coded subpacket may include all systematic bits (i.e., the original information bits) and some parity bits (i.e., redundancy information). A receiver can recover the data packet with just the first coded subpacket under favorable channel conditions. Each remaining coded subpacket includes additional parity bits.

Each coded subpacket may be further processed (e.g., by symbol mapping unit 426 in FIG. 4A) to generate a corresponding block of data symbols (or symbol block). (See paragraph [0048].) A data packet may thus be processed (e.g., encoded and modulated) to generate NB symbol blocks. The NB symbol blocks contain different portions of the coded information for the data packet. A receiver may be able to recover the data packet based on one or more symbol blocks, depending on the channel conditions. Each subsequent symbol block after the first symbol block may be considered as a retransmission of the data packet.

Examiner respectfully disagrees. As from recited above paragraphs, there is no mention of at most once. Further, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., coded packet, N_B coded subpackets, some parity bits (redundancy information)) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification

are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In addition, there is no support for the recited limitation NB symbol blocks contain different portions of the coded information for the data packet. Moreover, in the claim language, there is no mention of subpacket, NB symbol block, or coded packet or coded subpacket. Coded packet or coded subpackets are different from the coded information for the data packet. In conclusion, examiner believes that there is no support in the specification for the recited limitations "each symbol block including <u>a different portion</u> of the coded , unless the coded packet is divided and each division is used to obtain a symbol block and the limitation <u>at most.</u> If each of the plurality of symbol blocks is transmitted at most once to the receiver (if there is support for it in the specification), then what would happen if there is an error. The recovery process based on the incremental redundancy is absent from the claim language. Examiner believes that coded information is the parity (redundant information) that is missing in the claim language.

Applicant argued that APPA describes a system in which a data is processed based on a selected rate and transmitted in its entirely if there is decoding error. Piirainen describes a system in which symbols to be transmitted into blocks at a transmitter, and same blocks are transmitted if there is decoding error.

Examiner respectfully disagrees. Piirainen describes an incremental redundancy convolution coding and encoded bits are divided in blocks ,each block has a portion of encoded bits, and at the beginning, the first transceiver transmits only the first block to

the second block to the second block to the transceiver. The first block includes the bits for finding out the content of the whole packet in decoding if the signal-to-noise ratio is good enough (see column 7 lines 45-55).

Applicant argued that Tarokh teaches away from redundancy information.

Examiner respectfully disagrees. Tarokh teaches incremental redundancy with space-time codes (see the title “INCREMENTAL REDUNDANCY WITH SAPCE-TIME CODES”).

Applicant argued that the MMSE or MLD iterative process is not described by Tarokh.

Examiner respectively disagrees. An iterative process is process in which certain actions are repeated in loops (plurality of iterations) until a certain condition is satisfied or a counter calculating number of iterations is performed. Incidentally, paragraph 83 of Tarokh teaches incremental STBC through MMSE iterative method. However, the claim 37 does not recite IR which makes subject to restriction.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 8, 10, 13, 15, 21, 23, 26, 41, and 49 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s)

contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 1, 8, 10, 13, 15, 21, 23, 26, 41, and 49 recites the limitation “wherein each of the plurality of symbol blocks is transmitted <u>at most once</u> to the receiver”. There is no support for this limitation in the specification therefore this is a new matter.

Claims 1, 8, 10, 13, 15, 21, 23, 26, 41, and 49 recites the limitation “coded information”. There is no support for this limitation in the specification therefore this is a new matter.

Claims 1, 8, 10, 13, 15, 21, 23, 26, 41, and 49 recites the limitation “a different portion of the coded information”. There is no support for this limitation in the specification therefore this is a new matter.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, 5-14, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Piirainen (US 7,031,419 B2)** in view of Applicant Admitted Prior Art **(AAPA).**

For claims 1, 10, 13, and 41 **Piirainen** with exception of each symbol block including different coded information limitation for the data packet teaches a method/transmitter/apparatus/processor readable medium of performing incremental redundancy (IR) (see column 7 lines 45-55 “Incremental redundancy process”) transmission in a wireless multiple-input multiple-output (MIMO) communication system(see column 2 line 6 “MIMO”), comprising:

processing the coded information for the data packet to obtain a plurality of symbol blocks, each symbol block including a different portion of the coded information for the data packet (see column 8 lines 3-5 “the information packet to be transmitted is encoded (produces coded information) and then is divided (processed) to produce different symbol block", abstract “symbol blocks produced by a process”, column 1 lines 51-55 "diversity is achieved by coding each symbol block with different selected code (each symbol has different coded information)”, column 2 lines 42-43 “predetermined format being selected so that symbol block is transmitted from space-time block coding”, column 2 lines 45-65 “ a data packet processing based on the selected code”, column 3 lines 20-21 “utilization of both MIMO and space-time coding”, column 3 lines 54-60 “the coding included in retransmission enables noise immune transmission as the diversity increases compared to the case of a good channel”, column 7 lines 45-55

"incremental redundancy convolution coding and encoded bits are divided in blocks (each block has a portion of encoded bits), and at the beginning, the first transceiver transmits only the first block to the second block to the second block to the transceiver. The first block includes the bits for finding out the content of the whole packet in decoding if the signal-to-noise ratio is good enough", column 8 lines 1-5 "information encoded and divided into different block", and column 9 lines 61-63"selection can be made according to the known principles of space-time block coding");

transmitting a first symbol block from a-the plurality of transmit antennas at the transmitter to the plurality of receive antennas at the receiver, wherein the first symbol block is one of the plurality of symbol blocks (see abstract "symbols are divided into blocks and transmitted from transceivers to transceivers"); and

transmitting remaining ones of the plurality of symbol blocks, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted, wherein each of the plurality of symbol blocks is transmitted at most once to the receiver (see abstract "symbols are divided into blocks (plurality of blocks) and transmitted from transceivers to transceivers and checking whether the blocks were received successfully and combining blocks").

Piirainen does not expressly teach obtaining a selected rate for data transmission on a MIMO channel between a plurality of transmit antennas at a transmitter and a plurality of receive antennas at a receiver, the selected rate indicating a particular data rate, or a particular coding scheme, or a particular code rate, or a

particular modulation scheme, or a particular data packet size, or a combination thereof limitation; and

encoding a data packet in accordance with the selected rate to obtain coded information for the data packet;

However, **AAPA** teaches this limitation (see paragraph 6 “a selected rate may indicate data rate, coding scheme, modulation scheme, packet size, and so on”, paragraph 7 “in conventional MIMO system, a transmitter encodes, modulates, and transmits data in accordance with a rate that is selected based on a model of a static MIMO channel).

Thus, it would have been obvious to a person of ordinary skill in the art at time of invention to use the **AAPA** teachings in the data transmission and reception system of **Piirainen** to provide a selectable (adaptable) process rate or scheme for a MIMO system.

This combination is possible because both **Piirainen** and **AAPA** deal with the same problem of retransmission of symbol block when the received block is in error. In addition, both inventions use IR.

The motivation for this combination is to improve the throughput of MIMO system under various channel conditions by providing an adaptable coding scheme such as incremental redundancy that reduces the number of retransmissions..

For claims 3, 11-12, and 14 **Piirainen** teaches a method/transmitter/apparatus, wherein the processing includes

partitioning the coded information for the data packet into a plurality of coded subpackets (as discussed in claim 1 and see abstract , Fig. 4 “packet coding; division (partitioning) into bursts, and division of burst into groups”), and

modulating the plurality of coded subpackets in accordance with the particular modulation scheme indicated by the selected rate to obtain the plurality of symbol blocks (see column 1 lines 28-29 “data rate and modulation” and column 4 line 18 “CDMA and FDMA”).

For claim 5 **Piirainen** teaches a method, further comprising:

Receiving, at the transmitter, a negative acknowledgment (NAK) (see Fig. 4 “NACK”) for the packet from the receiver; and

transmitting a next symbol block among the remaining ones of the plurality of symbol blocks in response to receiving the NAK (see Fig. 4 “NACK”).

For claim 6 **Piirainen** teaches a method, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and wherein each of the plurality of symbol blocks is transmitted from a plurality of subbands of the plurality of transmit antennas, if the symbol block is selected for transmission (see Fig. 3 “MIMO data transmission” and column 4 line 18-19 “OFDM”).

For claim 7 **Piirainen** teaches a method, wherein at least two data packets are each processed in accordance with the selected rate to obtain at least two

pluralities of symbol blocks, one plurality of symbol blocks for each data packet, and wherein at least two symbol blocks for the at least two data packets are transmitted simultaneously from the plurality of transmit antennas to the plurality of receive antennas (see abstract “dividing symbols to be transmitted into blocks and transmitting blocks using each antenna and the division is based on the number of antennas” and column 9 line32 “simultaneously transmission”).

For claim 8 **Piirainen** teaches a method of performing incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system (see Fig. 3 “MIMO transmission”), comprising:

encoding at least two data packets to obtain a plurality of symbol blocks for the data packet, each symbol block including a different portion of the coded information for the data packet (as discussed in claim 1 and see abstract “plurality of symbol blocks have been obtained and processed");

transmitting a first symbol block for each data packet from a plurality of transmit antennas at a transmitter to a plurality of receive antennas at a receiver, wherein the first symbol block is one of the plurality of symbol blocks for the data packet (see abstract “transceiver, symbol blocks and antennas”); and

transmitting remaining ones of the plurality of symbol blocks for each data packet, one symbol block at a time, until the data packet is recovered correctly by the receiver or all of the plurality of symbol blocks are transmitted, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and wherein each

symbol block for each data packet is transmitted diagonally across a plurality of subbands and the plurality of transmit antennas, and wherein each of the plurality of symbol blocks for each data packet is transmitted at most once to the receiver (as discussed in claim 1 and see Fig. 3 “MIMO data transmission illustration”, column 4 line 19 “OFDM” and column 7 lines 5-6 “diagonal transmission”).

For claim 9 **Piirainen** teaches a method, wherein the MIMO system utilizes orthogonal frequency division multiplexing (OFDM), and the method further comprising:

Processing each Np data packets are each processed in accordance with the selected rate to obtain Np pluralities of symbol blocks,
one plurality of symbol blocks for each data packet, where Np is equal to or greater than one and is selected based on a rank of the MIMO channel, and

transmitting Np symbol blocks for the Np data packets are transmitted simultaneously diagonally across a plurality of subbands and the plurality of transmit antennas (see Fig. 3 “MIMO data transmission illustration”, column 4 line 19 “OFDM”, and column 6 lines 55-60 “formula 1”).

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Piirainen** in view of Applicant Admitted Prior Art **(AAPA)** and further in view of **Tarokh** et al. (US 2004/0057530 A1).

For claim 4 **Piirainen** in view of **AAPA** does not teach a method, wherein the coding scheme is a Turbo code, and wherein the first symbol block includes systematic bits for the data packets.

However, **Tarokh** teaches this limitation (see paragraph 52" Turbo code").

Thus, it would have been obvious to a person of ordinary skill in the art at the time of invention to use a coding scheme such as Turbo code taught by **Tarokh** in the encoder of **Piirainen** to adapt the symbol block with code which is more suitable with channel condition variations. This combination is possible because **Piirainen** uses the encoder of **Tarokh** (see column 9 line 63 **Tarokh**").

The motivation for this combination is to provide a symbol block transmitter that is adaptable to changes in the channel conditions.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 15-19, 22-24, 26-29, 31-40, and 49 are rejected under 35 U.S.C. 103 (a) as being unpatentable over **Tarokh (US 2004/0057530 A1)** in view of **Piirainen (US 7,031,419 B2)**.

For claims 15, 23, 26, and 49 **Tarokh** with exception of each symbol block including different coded information for the data packet teaches a method/receiver/apparatus/processor-readable medium of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system (see abstract “IR” and paragraph 8 “MIMO”), comprising:

obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet to obtain coded information for the data packet, each symbol block including a different portion of the coded information for the data packet, wherein each of the plurality of symbol blocks is transmitted at most once to the receiver (see abstract “a transmitter sends packets via blocks of symbol to the receive”, Fig. 5 “channel estimation, STC Decoder, Channel decoder, and Error detection”, paragraph 9 “detection algorithm”, paragraph 74 “detect decoded errors”, and paragraph 8 “antennas”);

decoding all detected symbol blocks obtained for the data packet to provide a decoded packet (see abstract “decoding symbols”);

determining whether the decoded packet is correct or in error (see abstract “decoding of incorrectly received packets”); and

repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error (see the abstract “ a

hybrid ARQ feedback mechanism being used to repeat the obtaining, decoding, and error detection" and paragraph 24 "automatic repeat"),

Tarokh does not teach encoding the data packet to obtain coded information for the data packet, wherein each symbol block including a different portion of the each symbol block including different coded information for the data packet.

However, **Piirainen** teaches this limitation (as discussed in claim 1).

Thus, it would have been obvious to the person of ordinary skill in the art at the time of invention to combine the teachings of **Piirainen** with teachings **Tarokh** to arrive at the claimed invention.

This combination is possible because they both deal with STBC and deal with IR.

The motivation for this combination is to improve the throughput of MIMO system.

For claims 16, 24, and 27 **Tarokh** teaches a method/receiver/apparatus, further comprising:

receiving a block of received symbols for the data symbol block; and

processing the received symbol block to obtain the detected symbol block (see abstract "obtained blocks of symbols are sent via transmitter to receiver", Fig. 5 CRC and ERROR DETECTION", and paragraph 63 "incoming bits, packets, or symbol are monitored and in case error HARQ algorithm is performed").

For claim 17 **Tarokh** teaches a method, wherein the processing the received

symbol block comprises processing the received symbol block ~~detecting~~ is based on a minimum mean square error (MMSE) detector, a maximal ratio combining (MRC) detector, or a linear zero-forcing (ZF) detector, or a combination thereof (see paragraph 80 “decoding techniques such as Zero-forcing & minimum square error”).

For claim 18 **Tarokh** teaches a method, further comprising:
terminating the obtaining, decoding, and determining if the decoded packet is correct or if the plurality of data symbol blocks for the data packet have been transmitted (see paragraph 25 “feedback mechanism”).

For claim 19 **Tarokh** teaches a method, further comprising:
sending an acknowledgment (ACK) for the data symbol block if the decoded packet is correct or a negative acknowledgment (NAK) if the decoded packet is in error (see paragraph 24 “ACK & NAK”).

For claim 22 **Tarokh** in view of **AAPA** teaches a method, further comprising:

deriving a signal-to-noise-and-interference ratio (SNR) estimate for each of the plurality of transmit antennas (see paragraph 59 “SNR and channel estimation function”),

computing an average SNR based on SNR estimates for the plurality of transmit antennas (see **Tarokh:** paragraph 59 “SNR with antenna” and paragraph 64 “SNR & CQI”),

determining a back-off factor (see paragraph 101 “delay diversity”), and

selecting a rate based on the average SNR and the back-off factor, for data transmission on a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas, the selected rate indicating a particular data rate, or a particular coding scheme, or a particular code rate, or a particular modulation scheme, or a particular data packet size, or a combination thereof limitation (see **Tarokh:** paragraph 101 “delay diversity and data rate”).

For claims 28, 33, and 35 **Tarokh** in view of **Piirainen** teaches a method/receiver/apparatus of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

receiving a block of received symbols for a data packet, wherein the received symbol block is for a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet (see abstract “obtained bocks of symbols are sent to the receiver”, paragraph 60 "the symbols from incoming signal and channel estimates are provided to the decoder", and claim 21 f “STB is used to decode a first estimate for the original symbols”);

detecting all received symbol blocks received for the data packet to obtain detected symbol blocks, one detected symbol block for each received symbol block(see

abstract and paragraphs 25, 42, 77, and 78 “symbol blocks are decoded to recover packets and determine whether there are errors to initiate HARQ”);

decoding the detected symbol blocks for the data packet to obtain decoder feedback information (see abstract “at the receiver is determined whether the received symbol is in error or not that determination information is used as a feedback to the transmitter”);

performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration (see abstract “hybrid ARQ feedback mechanism” paragraph 83 “iterative MMSE and MLD, an be used to improve the system performance”); and

generating a decoded packet based on an output from the decoding for a last iteration among the plurality of iteration (see abstract “hybrid ARQ feedback mechanism” paragraph 83 “iterative MMSE and MLD, can be used to improve the system performance”).

Tarokh does not teach the “by encoding the data packet to obtain coded information for the data packet, each data symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver” limitation.

However, **Piirainen** teaches this limitation (as discussed in claim 1 and claim 15)

For claims 29 and 36 **Tarokh** teaches a method/apparatus, further comprising:

determining whether the decoded packet is correct or in error (see abstract “error detection”, and

repeating the receiving, detecting, decoding, performing, and generating for another one of the plurality of data symbol blocks if the decoded packet is in error and if all of the plurality of data symbol blocks have not been transmitted (see abstract “multiple of symbol blocks being communicated between transmitter and receiver in case received error automatic request is initiated with feedback mechanism that can be repeated until the correct symbol, packet or bit are received ARQ, and error detection” .

For claim 31 **Tarokh** teaches a method, wherein the detecting is based on a minimum mean square error (MMSE) detector, or a maximal ratio combining (MRC) detector, or a linear zero-forcing (ZF) detector, or a combination thereof (see paragraph 80 “decoding techniques such as Zero-forcing & minimum square error”).

For claim 32 **Tarokh** teaches a method, wherein the MMSE detector is used for the detecting for at least one iteration and the MRC detector or the ZF detector is used for the detecting after N iterations, the at least one iteration (see “iterative MMSE and MLD, an be used to improve the system performance-N is definite”).

For claim 34 **Tarokh** teaches a receiver, further comprising:

a controller operative to, if the decoded packet is in error and if all of the plurality of data symbol blocks have not been transmitted, direct the buffer to receive and store

another received symbol block for another one of the plurality of data symbol blocks, and to direct the detector and decoder to perform detection and decoding on all received symbol blocks received for the data packet to obtain the decoded packet (see paragraph 70 “received signals stored from the first transmission along the symbol received during retransmission” and paragraph 79 receiver store received symbols in case they are not properly decoded").

For claim 37 **Tarokh** teaches a method of receiving a data transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

detecting received symbols for a data packet to obtain detected symbols (see abstract “decode the received blocks of symbols”);

decoding the detected symbols to obtain decoder feedback information (see abstract “at the receiver is determined whether the received symbol is in error or not that determination information is used as a feedback to the transmitter”);

performing the detecting and decoding for a plurality of iterations, wherein the decoder feedback information from the decoding for a current iteration is used by the detecting for a subsequent iteration, wherein the detecting is performed based on a minimum mean square error (MMSE) detector for at least one iteration initially and thereafter based on a maximal ratio combining (MRC) detector or a linear zero-forcing (ZF) detector for remaining ones of the plurality of iterations (see paragraph 80 “decoding techniques such as Zero-forcing & minimum square error”, paragraph 83 "iterative MMSE and MLD").; and

generating a decoded packet based on an output from the decoding for a last iteration among the plurality of iteration (see paragraph 83 “iterative MMSE”).

For claim 38 **Tarokh** teaches a method, wherein the detecting is performed based on the MMSE detector for only a first iteration and based on the MRC detector or the ZF detector for remaining ones of the plurality of iterations ~~N is equal to one~~ (see abstract the feedback mechanism perform as a loop when there is an error it feeds back the information to the transmitter the number of iteration can be programmed the number of iteration is at least one if there is an error. However, the number repetition can be set to any value 1 or greater than1.”).

For claim 39 **Tarokh** teaches a method, further comprising:

transmitting the data packet and at least one additional data packet in an interlaced manner, wherein symbol blocks for each data packet are transmitted in slots spaced apart by a predetermined number of slots (see abstract “additional symbols are sent” Fig. 4 “SYMBOL INTERLEAVE & BIT INTERLEAVE” , Fig. 5 “SYMBOL DE-INTERLEAVE & BIT DE-INTERLEAVE” and paragraph 85 “next available time slot”).

8. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Tarokh et al. (US 2004/0057530 A1)** in view of **Alouini et al. (US 6,304,593 B1)** further in view of **Lakkis (US 7,031,371 B1).**

For claim 21 **Tarokh** teaches a method of receiving an incremental redundancy (IR) transmission in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

obtaining a block of detected symbols for a data packet, wherein the detected symbol block is an estimate of a data symbol block transmitted from a plurality of transmit antennas at a transmitter and received by a plurality of receive antennas at a receiver, and wherein the data symbol block is one of a plurality of data symbol blocks generated for the data packet by encoding the data packet based on the rate to obtain coded information for the data packet, each symbol block including a different portion of the coded information for the data packet and being transmitted at most once to the receiver (see abstract "obtained bocks of symbols are sent to the receiver", paragraph 60 "the symbols from incoming signal and channel estimates are provided to the decoder", and claim 21 f "STB is used to decode a first estimate for the original symbols" and see claim 15);

decoding all detected symbol blocks obtained for the data packet to provide a decoded packet (see abstract and paragraphs 25, 42, 77, and 78 "symbol blocks are decoded to recover packets and determine whether there are errors to initiate HARQ") ;

determining whether the decoded packet is correct or in error (see abstract and paragraphs 25 and 42 "symbol blocks are decoded to recover packets and determine whether there are errors to initiate HARQ");

repeating the obtaining, decoding, and determining for another one of the plurality of data symbol blocks if the decoded packet is in error (see paragraph 24 “automatic repeat request (ARQ)”); and

Tarokh does not teach Determining a rate for data transmission based on an average spectral efficiency for a plurality of transmit antennas at a transmitter, the selected rate indicating a particular data rate, or a particular coding scheme, or a particular code rate, or a particular modulation scheme, or a particular data packet size, or a combination thereof.

However, **Alouini** teach this limitation (see column 2 lines 3-10 “average spectral efficiency definition and its relation to the data rate and bandwidth”). Thus, it would have been obvious to the person of ordinary skill in the art at the time of invention to use the teaching of **Alouini** with teaching **Tarokh** to arrive derive a formula for rate calculation.

This combination is possible because **Tarokh** teaches bandwidth and data rate and various coding, modulation, and decoding techniques.

The motivation for this combination is to optimize the overall throughput of MIMO data communication.

9. Claims 42-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Tarokh et al. (US 2004/0057530 A1)** in view of **Haustein et al. (US 7,366,520 B2).**

For claim 42-48 **Tarokh** teaches a method/receiver/apparatus/, further comprising:

obtaining channel estimates for a MIMO channel between the plurality of transmit antennas and the plurality of receive antennas (see paragraph 57"pilot signals are used for channel estimation"; and

Tarokh does teach selecting, based on the channel estimates, a rate for data transmission on the MIMO channel. However, **Haustein** teaches this limitation (see claim 1 "estimation of the channel matrix is determined at a symbol rate in dependence at the channel properties whereby making use of the reciprocity of MIMO channel").

Thus, it would have been obvious to the person of ordinary skill in the art at the time of invention to use the information taught by **Haustein** to draw various rate from the MIMO channel estimation.

The motivation for this combination is to enhance the overall throughput of MIMO channel.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: **Thomas et al. (US 6,987,819 B2)** and **Agrawal et al. (US 6,873,606 B2).**

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID OVEISSI whose telephone number is (571)270-3127. The examiner can normally be reached on Monday to Friday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Ricky Ngo can be reached on (571) 272-3139. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ricky Ngo/
Supervisory Patent Examiner, Art Unit 2464

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